

Determinants of anemia among pregnant women in Jeneponto regency

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ABSTRACT

Background: The prevalence of anemia among pregnant women is becoming public health problem worldwide including Indonesia. The aim of this study was to examine the prevalence and determinant factors of anemia among pregnant mothers in Jeneponto Regency, Indonesia.

Methods: This cross-sectional study was conducted in six sub-districts (Bangkala, Bontoramba, Tamalatea, Binamu, Tarawang, and Kelara subdistricts) in Jeneponto Regency, South Sulawesi, Indonesia. A total 616 samples of pregnant women were evaluated. The Diaspect™ tool was used to measure hemoglobin (Hb) by Cyanmethemoglobin method. Data regarding household characteristics, pregnancy history, maternal age, supplementary feeding (PMT) programme enrolment, and dietary pattern was collected by trained enumerators. Data were analyzed using chi-square and performed by SPSS.

Results: There was 17.3% of study participant did not complete primary school or never attended school. As many as 82.4% of households had members that still actively smoked. The majority of households had latrines (62.0%), homes constructed from wood/bamboo (69.5%), and drinking water from cement wells (28.2%). The average body weight and height were 53.88 kg and 152.37 cm, respectively. The average middle-upper arm circumference was 25.72 cm, and mean Hb was 11.31 g/dL. The prevalence of anemia in Jeneponto Regency reached 39.08%. Only two determinant factors were significantly associated with anemia: Gestational age and PMT programme enrollment.

Conclusion: The prevalence of anemia in pregnant women in Jeneponto Regency remains very high and exceeds global and national prevalence rates. Gestational age and PMT programme enrollment are two anemia determinant factors among pregnant mothers in Jeneponto Regency.

Key words: Anemia, pregnant women, determinant factors, gestational age, food supplementation, and nutritional deficiency

INTRODUCTION

According to the WHO, the incidence of anemia among pregnant women is increasing, with more than 30 million (38.2%) pregnant women with anemia around the world. Moreover, that number is predicted to increase significantly in the future.^[1] Anemia is a condition in which the body experiences a decrease in red blood cells and impaired oxygen delivery via blood. These conditions differ by sex, age, and physiological conditions, such as pregnancy, as well as the presence of genetic diseases.^[2,3] The negative effects of anemia in pregnant mothers can occur in the short and long term. However, the most notable effect of anemia in pregnant women is on pregnancy outcome. Studies have shown that problems, such as inhibited fetal growth, bleeding during labor and low infant weight and placental size, occur when mothers experience anemia during pregnancy.^[4] In developing countries, the problem of anemia in pregnant mothers is worrying. A study in Ethiopia showed that the prevalence of anemia in pregnant mothers who were receiving antenatal care services reached 39.1%,^[5] while in Indonesia, the prevalence of anemia among

pregnant mothers in the countryside reached 37.8%, according to a basic health research survey in 2013.^[6]

Anemia is characterized by a hemoglobin level (Hb) less than normal; in pregnant women, Hb <11 g/dL indicates anemia.^[7] A major contributor to anemia in pregnant mothers is the lack of dietary intake of iron (Fe).^[8] In addition, most pregnant mothers from developing countries (low-middle income) begin their pregnancy with deficiencies in certain nutrients, including iron; therefore, fulfilling the iron requirements of the mother and fetus is difficult.^[9] Furthermore, disease factors (parasitic infections, malaria, etc.), workload, social conditions, pregnancy history, menstruation, and bleeding history also require attention.^[3,5] Although anemia is a controllable disease, most individuals are unaware that they are anemic. Therefore, anemia remains prevalent, especially in developing countries.^[10] This study aimed to identify the determinant factors of anemia in pregnant women in Jeneponto Regency. In addition, this study is a baseline study of a cohort of pregnant women and infants.

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MATERIALS AND METHODS

This cross-sectional study was conducted from July to September 2016. This research was conducted in six subdistricts in the Jeneponto Region, namely, Bangkala, Bontoramba, Tamalatea, Binamu, Tarowang, and Kelara, and was divided into two stages. The first stage was the screening stage, which aimed to determine the prevalence of anemia in pregnant mothers in the six subdistricts. The second stage involved collecting basic data regarding the anaemia determinant factors of pregnant mothers in Jeneponto Regency. A total of 628 pregnant mothers were recruited at the screening stage, and 616 pregnant mothers were evaluated in the baseline study.

The calibrated Diaspect™ tool was used to measure Hb concentration.^[11] The blood of pregnant women was obtained through a finger prick by a trained enumerator. A total of 15 prospective data collectors were trained for 3 days, and the 12 best candidates were selected to become enumerators (2 persons per sub-district). In addition, two officers assisted with data management by entering the data and refining the data. All investigators were in the field for 7 months.

The potential determinant factors measured in this study include the following: Household characteristics, pregnancy history, maternal age, enrollment in supplementary feeding (PMT) programme, and dietary pattern. The variables were measured using structured questionnaires that were developed and used in previous studies.^[12,13] The pregnancy history was also confirmed through the medical records of the mothers at the community health clinic, while dietary patterns were collected by 24 h food recall. The inclusion criteria were (1) Hb of 9–12 g/dL or individuals without severe anemia, (2) mid-upper arm circumference ≥ 21 cm with or without severe chronic energy deficiency (CED), (3) aged 20–35 years, (4) single fetus, and (5) did not consume other multivitamins. The data management team made multiple inputs to maintain the validity of the data. Descriptive and analytic data were analyzed. Chi square analysis was performed to determine the correlation between the determinant variable and the dependent variable (anemia).

RESULTS

The characteristics of respondents in this study were shown in Table 1. The average age of pregnant women was 26 years at 17 weeks of gestation or in the second trimester. The level of education among the patient cohort was good; only 17.3% of patients did not complete primary school or never attended school. Based on smoking status of the household family members, the number smoking by family members were 82.5%. The majority of households had their own latrines (62.0%), homes that were constructed of wood/bamboo (69.5%), and drinking water from cement wells (28.2%).

The measurements of Hb and anemia status are shown in Table 2. The highest prevalence of anaemia was in Bangkala subdistrict while the lowest was Binamu subdistrict (57.6% vs. 30.2%). There was no significant difference based on sub-districts for Hb concentration. Bangkala subdistrict showed the lowest average Hb, whereas Bontoramba had the highest average Hb (10.82 vs. 11.68 g/dL). This finding indicates that the Bangkala area had a

sufficient number of pregnant women with anemia (<11 g/dL). Interestingly, based on geography, the Bontoramba and Bangkala subdistricts are adjacent to each other.

The determinants of anemia were shown in Table 3. Variables, such as the level of education and employment status of the mothers, gestational age, smoking status among household members, CED status, pregnant mother class, whether the mother was enrolled in PMT and iron supplementation programmes, and the current number of children were evaluated. Among these variables, only three variables were significantly associated with anemia: Gestational age, receiving PMT program, and food group intake. Anemia was more prevalent among pregnant mothers with a gestational age of >17 weeks than among those with a gestational age of <17 weeks (46.5% vs. 31.9%, $P < 0.001$). Moreover, pregnant mothers who received the PMT program accounted for more than 50% of the anaemic patients compared to those who did not receive the PMT program (37.9%). Interestingly, parity was not correlated with anemia.

As shown in Table 4, this study also has done multivariate analysis using logistic regression by including variables that have $P < 0.25$ in bivariate analysis. After controlling six variables, there were two determinants of anemia, namely, gestational age and receiving PMT programme. However, gestational status is considered as protective factors for anemia (odds ratio = 0.920; 95% confidence interval = 0.885–0.957, $P = 0.009$).

Table 1: Characteristics of pregnant mothers

Variables (n=616)	n(%)
Age, mean \pm SD	26.77 \pm 6.38
Gestational age, mean \pm SD	17.19 \pm 4.33
Household members, mean \pm SD	4.47 \pm 1.80
Maternal education, not completed primary school	106 (17.3)
Occupation status, work	119 (19.4)
Household members who smoke, yes	508 (82.5)
Income, <1 million IDR/month	189 (30.8)
Latrines, owned in the home	382 (62.0)
House construction, wooden/bamboo house	428 (69.5)
Drinking water source, cement wells	173 (28.2)
Daily meal frequency, mean \pm SD	2.60 \pm 0.57
Height, mean \pm SD	152.37 \pm 5.32
Weight at initial pregnancy check-up, mean \pm SD (n=603)	48.35 \pm 16.42
Weight at baseline, mean \pm SD	53.88 \pm 9.45
Hb level, mean \pm SD	11.31 \pm 1.28
MUAC, mean \pm SD	25.72 \pm 2.94

SD: Standard deviation, MUAC: Mid-upper arm circumference

Table 2: Prevalence of anemia and mean of Hb concentration among pregnant mothers based on sub-district

Subdistrict	Anemia n (%)	Hb
Bontoramba (n=99)	24 (24.2)	11.68 \pm 1.13
Bangkala (n=99)	57 (57.6)	10.82 \pm 1.51
Tamalatea (n=100)	38 (38.0)	11.29 \pm 1.31
Binamu (n=116)	35 (30.2)	11.47 \pm 1.18
Tarowang (n=100)	40 (40.0)	11.26 \pm 1.16
Kelara (n=102)	46 (45.1)	11.29 \pm 1.21
Total (n=616)	240 (39.0)	11.31 \pm 1.28

Table 3: Determinant factors of anemia among pregnant mothers

Variable (n=616)	n (%)			P
	Anaemia	Normal	Total	
Age (years old)				
≥26	134 (39.2)	208 (60.8)	342 (100)	0.93
<26	106 (38.7)	168 (61.3)	274 (100)	
Education				
Low (<secondary high school)	155 (37.3)	260 (62.7)	415 (100)	0.25
High (≥secondary high school)	85 (42.3)	116 (57.7)	201 (100)	
Occupation				
Unemployed	186 (37.4)	311 (62.6)	497 (100)	0.11
Employed	54 (45.4)	65 (54.6)	119 (100)	
Gestational age (weeks)				
≥17	139 (46.5)	160 (53.5)	299 (100)	0.00
<17	101 (31.9)	216 (68.1)	317 (100)	
Smoking status among household members				
Yes	196 (38.6)	312 (61.4)	508 (100)	0.74
No	44 (40.7)	64 (59.3)	108 (100)	
CED				
Yes	57 (43.5)	74 (56.5)	131 (100)	0.26
No	183 (37.7)	302 (62.3)	485 (100)	
Planned pregnancy				
No	21 (43.8)	27 (56.3)	48 (100)	0.53
Yes	219 (38.6)	349 (61.4)	568 (100)	
Received supplementary feeding (PMT) program				
No	220 (37.9)	361 (62.1)	581 (100)	0.03
Yes	20 (57.1)	15 (42.9)	35 (100)	
Number of children				
≥3	112 (40.1)	167 (59.9)	279 (100)	0.619
<3	128 (38.0)	20.9 (62.0)	337 (100)	
Food group				
2–3	199 (38.0)	324 (62.0)	523 (100)	0.016
4	15 (68.2)	7 (31.8)	22 (100)	
5	26 (36.6)	45 (63.4)	71 (100)	
Total	240 (39.0)	376 (61.0)	616 (100)	

CED: Chronic energy deficiency

Table 4: Logistic regression analysis of determinant factors of anemia among pregnant women

Variable	OR	95% CI	P
Education (low)	0.986	0.938–1036	0.573
Occupation (unemployed)	0.711	0.451–1.123	0.144
Gestational age	0.920	0.885–0.957	<0.001
CED (yes)	1.085	1.021–1.153	0.009
Received PMT program (no)	0.679	0.326–1.414	0.301
Food group (2–3 groups)	1.255	0.716–2.197	0.428

The variables we took those $P < 0.25$. OR: Odds ratio, CI: Confidence interval, CED: Chronic energy deficiency

DISCUSSION

Anemia has become a public health nutrition problem that primarily affects pregnant women. In developing countries, such as India, Pakistan, and Indonesia, more than 50% of pregnant mothers have iron deficiency anemia.^[4,5] In Indonesia, the prevalence of

anemia in pregnant mothers reached 37.1% in 2013.^[6] This study indicates that the problem of anemia in Jeneponto Regency is worrying. When compared with the prevalence of anemia globally and nationally, the prevalence of pregnant mothers with anemia is slightly higher. Anemia is often associated with adverse pregnancy outcomes, which can even impact the health of children in the future.^[14,15] Anemia in early pregnancy can increase the risk of miscarriage, prematurity, and death of the mother and child.^[16] To overcome this issue, studies and supplementation programmes for both iron and other multimicronutrient deficiencies have been established for pregnant women, including those in Indonesia.^[17,18]

There are two main findings of this study, namely, prevalence of anemia and determinant factors of anemia among pregnant women. This study showed disparity among areas regarding anemia prevalence although the difference was not significant. This result may be due to the characteristics of subdistricts and the distances to health services are similar. In addition, differences in accessibility, affordability, and acceptance by communities will make a difference in health outcomes in the population.^[19] A study has explained the role of various factors in the occurrence of anemia, including demographics and infections.^[20] In the countryside, anemia is often caused by nutritional deficiency, chronic disease, and chronic blood loss.^[21] Socioeconomic factors, demographics, and geography also affect the prevalence of anemia in pregnant mothers.^[22]

The second note of result showed that gestational age, receiving PMT program, and food group intake was associated significantly to anemia events. In another study, the determinants of anemia were gestational age.^[9] Higher gestational age correlated with a greater number of anemia cases. Studies in developing countries, such as Ethiopia, have shown that the incidence of anemia increases significantly in the second and third trimesters compared with the first trimester, which may be attributed to the sharing of iron between the mother and fetus.^[23] Therefore, the need for iron increases significantly with an increase of gestational age, and if the mothers do not increase dietary iron intake, both the mother and the fetus will experience iron deficiency.

Although in this study, age variables were not significantly correlated with anemia, there was a trend of increased anemia prevalence among pregnant mothers over the age of 26 compared to those <26 years old. A study has previously reported an increased incidence of anemia among pregnant mothers over 26 years of age.^[24] In Pakistan, the prevalence of anemia, mild anemia, and moderate-to-severe anemia was shown to increase with maternal age.^[25] However, this mechanism cannot be explained in detail and thus requires further study.

Beside gestational age, receiving PMT program is proven to be determinants of anemia. Anemia was more prevalent among pregnant mothers who received the PMT program than among those who did not receive the PMT program (57% vs. 38%). These findings are supported by previous studies that have shown that the PMT program could affect both maternal and infant conditions. Fundamentally, government provides PMT program to anticipate malnutrition during pregnancy. This programme is specifically tailored for malnourished mothers. Supplementation programmes, such as supplemental feeding (PMT) programs, are quite effective at improving the nutritional statuses of pregnant mothers. However, nutritional supplementation should begin during the preconception period to achieve optimal fetal growth.^[25]

Ultimately, food group intake was considered as determinants of anemia among pregnant women in Jeneponto Regency. Attention to nutrient intake is required to meet the nutritional needs of mothers and fetuses. Lack of nutrition in the preconception period (pre-pregnancy) can lead to maternal nutritional deficiency and, thus, fetal nutritional deficiency, which can inhibit fetal growth and increase the risk of low birth weight or premature birth.^[26] However, the study did not control for the daily food intake of the pregnant mothers or other related behavioral aspects. We believe sufficiency in food consumption together with food taboos or food beliefs are also determinant factors of anemia in pregnant mothers and should be evaluated in the future studies.

CONCLUSION

The prevalence of anemia in pregnant mothers is still very high in the Jeneponto region, exceeding global, and national prevalence rates. The determinant factors of anemia include gestational age and enrollment in PMT program; however, these findings need to be further evaluated by controlling for variables. Additional studies need to be conducted to observe the effects of supplementation in the preconception period on pregnancy outcomes.

Significance Statement

This study identified the determinant factors of anemia during pregnancy specifically in the Jeneponto area. This information is very important for the local government, as it may be beneficial for designing programmes to prevent anemia among pregnant mothers. This study also described the prevalence of anemia in a rural area, as Jeneponto Regency is one of the poorest areas in South Sulawesi Province, Indonesia.

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